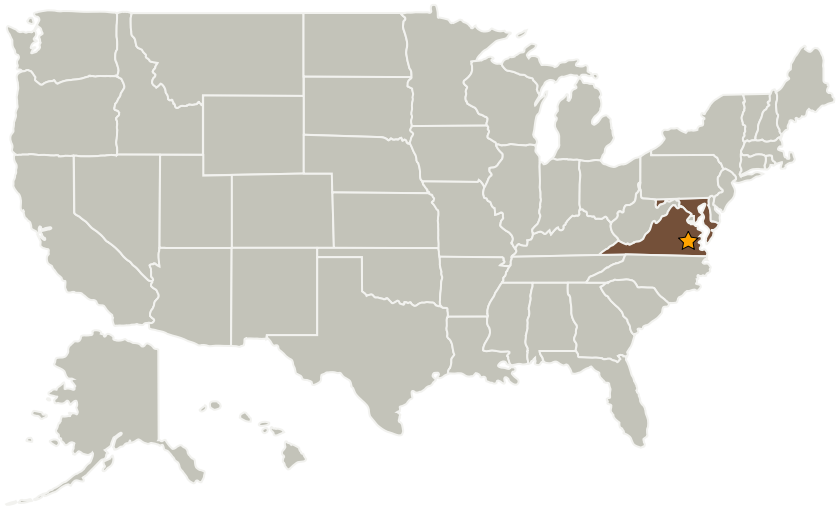
Bifurcation Tools for Flight Dynamics Analysis and Control System Design, Phase I

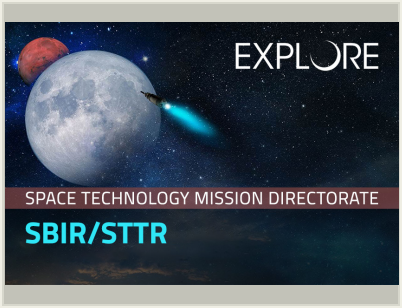
Completed Technology Project (2004 - 2004)

Project Introduction

Modern bifurcation analysis methods have been proposed for investigating flight dynamics and control system design in highly nonlinear regimes and also for the validation of control systems prior to flight. In this project we propose to build a computer analysis system that integrates symbolic and numerical methods within an interactive graphical framework. The system will be designed to enable flight dynamical analysis and control system design and analysis around bifurcation points. It will based on prior work by the investigators, bringing together bifurcation analysis tools, nonlinear control design tools and new methods developed by them that addresses bifurcations in controlled dynamical systems. The project is unique in three respects: 1) it integrates symbolic and numerical computing methods to achieve more efficient and more reliable results, 2) it provides a powerful user interface that allows essential visualization options and enables the analyst to build and modify models and choose from a variety bifurcation analysis tools, and 3) it integrates symbolic nonlinear control system analysis constructions so that the analyst has the means to ask the appropriate questions in this highly nonlinear regime.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Techno-Sciences, Inc.	Supporting Organization	Industry	Beltsville, Maryland

Primary U.S. Work Locations	
Maryland	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Gaurav Bajpai

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.3 Aeroelasticity